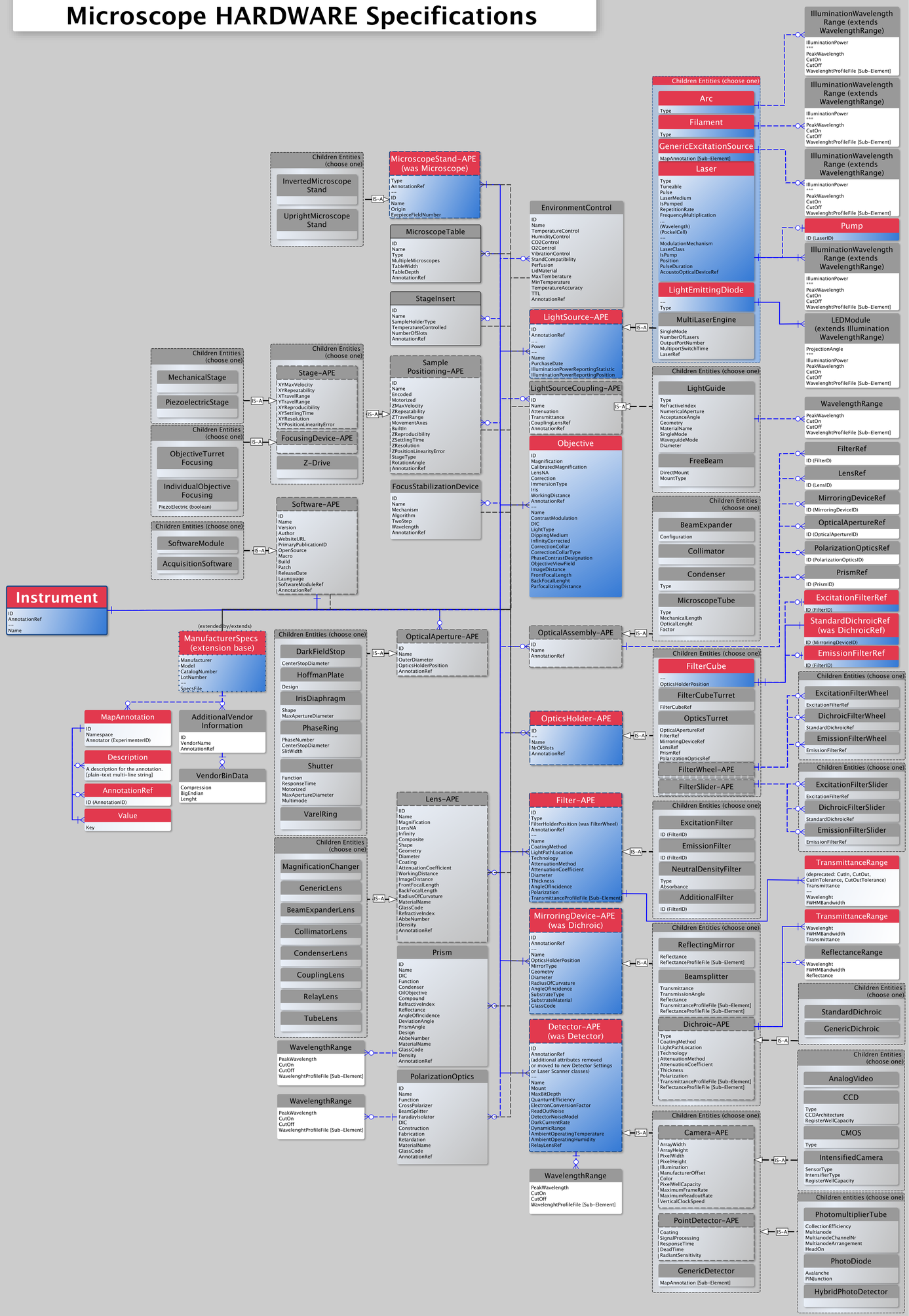
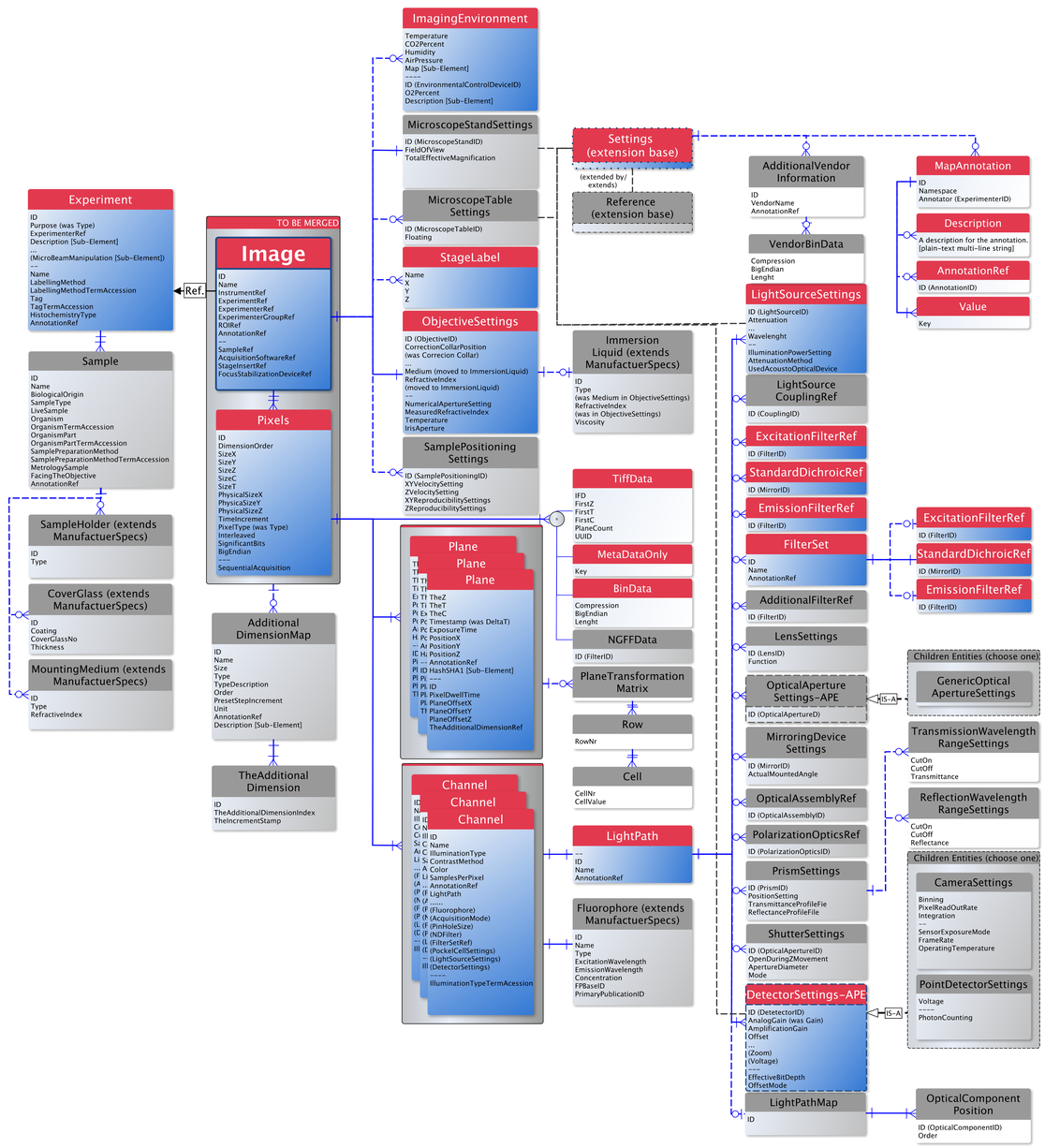
OME Core vs. 4DN-BINA-OME Basic Extension Microscope HARDWARE Specifications



OME Core vs. 4DN-BINA-OME Basic Extension Image ACQUISITION Settings



Legend

This is a Entity-Relationship diagrammatic representation of a proposed REVISION of the OME Core data model (blue/red boxes) along side a proposed OME BASIC EXTENSION (grey boxes) developed by members of the Imaging Working Group of the 4D Nucleome network (https://www.4dnucleome.org) and by members of the BINA Quality Control and Data Management Working Group (https://www.bioimagingna.org/qc-dm-wg).

The Entity-Relationship formalism can be utilized to model information about a real-world situation or an actual object (in this case a Microscope INSTRUMENT and an IMAGE acquired using that Instrument) by using three types of model elements:
1) ENTITIES, represented by Boxes;
2) RELATIONSHIPS, represented by blue lines connecting boxes; and
3) ATTRIBUTES, represented by fields within boxes

When describing a real-life situation or object:
1) ENTITIES correspond to NOUNS = the items we want to collect information about.
2) RELATIONSHIPS correspond to VERBS = actions/states/occurrences that connect Entities with each other
3) ATTRIBUTES correspond to ADJECTIVES = they describe the actual information (in our case metadata) that we want to record about each Entity.

In order to interpret the schema please start either from the <INSTRUMENT> element for the Microscope Hardware Specifications section of the diagram or from the <IMAGE> element of the Image Acquisition Settings sections.Then follow the blue lines to the connected boxes and think something like:
1) An Instrument has a Microscope Body, might rest on a Microscope Table, utilizes a Light Source and magnifies the sample using an Objective.
2) Alternatively, an Image was produced as part of a specific Experiment, was collected in a specific Imaging Environment and using specific Microscope Settings and has four Channels.

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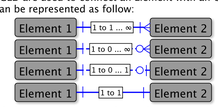
Notes

Blue edges, blue edges represent RELATIONSHIPs between entities. SOLID EDGES are used to connect an Element with a REQUIRED Sub-Element. DASHED EDGED are used to connect an Element with an OPTIONAL Sub-Element.
In addition, different CARDINALITIES can be represented as follow:



Black dashed arrows, these arrows simbolize an inheritance relationship similar to what would connect a hypothetical "Feline" parent element with a "Cat" child element. In this example, while the "Cat" element represents a "concrete" entity that exist in the real-world, the "Feline" element represents an "abstract" category that only useful for categorization pruposes. In a similar manner, these arrows connect concrete elements that represents actual microscope hardware components with their Abstract Parent Elements (APE), which are utilized for making the model less repetitive and more efficient to read by software tools.
These arrows should be read as follows, a "Laser" IS-A "LightSource".

Dashed grey edges, these edges signify "Extends" and they should be read as follows: "Objective" extends "ManufacturerSpecs". In this example, the concept of extension indicates that Objective is of type "ManufacturerSpecs" but it has additional attributes that are unique to it and distinguishes from other elements.
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-AnnotationRef, This element always refers to a Comment/Annotation element as described for Channel. However for simplicity sake most Comment/Annotation elements have been omitted and the AnnotationRef has been inserted in the referring element as an attribute.
-[Sub-Element], For simplicity and when indicated Sub-Elements are listed within the referring element as an attribute.
-References, For simplicity and when indicated, Reference elements (e.g., ImageRef) are listed whithin the referring element as attributes.
-Units were omitted from this diagram for simplicity. However, they are essential for reproducibility and they are included in the model and in all its formal representations.
-Attributes listed after the --- separator have been added to the OME Core as part of the proposed revision.
-Attributes listed in parenthesis and after the .... separator have been removed as part of the proposed extension.
-APE, Abstract Parent Entity (see explanation above).